International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Assessment Autumn-2020	Program: B.Sc. Engg. (EEE)
Course Code: EEE-3603	Course Title: Digital Signal Processing-I
Time: **5 hours** (Writing - **4 hours 30 minutes** + **30 minutes** submission time)	Full Marks: **50** (**Written** 30 + **Viva/Viva-Quiz**-20)

[Answer **each of the** questions from the followings; Figures in the right margin indicate full marks. **Answer script must be submitted through online method within 5 hours from starting time. Also, write down the Q. Set on the front page of your answer script]**

Q. Set-A

1(a).	Determine the z transform of $x(n) = (\frac{1}{2})^n u(n) + (\frac{5}{2})^n u(-n-1)$. Also draw ROC and pole zero location of X(z).	**CO2**	**E**	**02**
1(b).	Determine the inverse z transform of $X(z) = \frac{1}{1-z^{-2}}$ When (a) ROC $\|z\| > 1$ (b) ROC $\|z\| < 1$.	**CO2**	**E**	**02**
1(c).	Find the z transform of (a) $x(n) = a^n u(n) * u(n)$ (b) $x(n) = \sin\frac{n}{2}$	**CO2**	**E**	**02**
2(a).	Write down the advantages of Linear Phase FIR system.	**CO2**	**R**	**01**
2(b).	Determine the cascade form realization of the system described by the system function $H(z) = 1 - \frac{1}{5}z^{-1} + \frac{1}{7}z^{-2} + 2z^{-3}$	**CO2**	**E**	**02**
2(c).	Determine the parallel realization with second order and first order subsections for a LTI system described by the system function $H(z) = \frac{1+z^{-1}+3z^{-2}}{1+.25z^{-1}-.1z^{-2}}$	**CO2**	**E**	**03**
3(a).	Determine the circular convolution by using graphical method of two sequences $X_1(n) = \{4,1,5,1\}$ and $X_2(n) = \{4,5,6,7\}$ (↑ on 4 in X_1, ↑ on 4 in X_2)	**CO2**	**E**	**02**
3(b).	Compare between DFT and DTFT.	**CO2**	**R**	**02**
3(c).	Compute the linear convolution of the following two sequences by circular convolution $x(n) = \{1,4,5,8\}$, $h(n) = \{h_1,h_2,h_3\}$ (↑ on 1 in x, ↑ on h_2). Assume the values of h_1, h_2 &h_3 .	**CO2**	**E**	**02**
4(a).	Explain the spectral inversion and spectral reversal technique for low-pass to high-pass filter conversion.	**CO3**	**E**	**02**
4(b).	Design a FIR low-pass filter having length 7 and ω_c=1radian/sample. Use Hanning window for the design process.	**CO3**	**C**	**03**

4(c).	Why an ideal low pass filter is not physically realizable?	**CO3**	**R**	**01**
5(a)	Design a low pass filter with cut-off frequency of .3π using bilinear transformation applied to the analog filter $$H(s) = \frac{\omega_a}{s+\omega_a}$$ where ω_a is the frequency of the analog filter and T=1s.	**CO3**	**C**	**03**
5(b).	"Shifting the passband of DC notch we can design Hum removal filter" – Explain the above statement.	**CO3**	**E**	**03**
6.	Viva/Viva-Quiz: The time of viva/viva-quiz will be declared in google classroom.			